



Wildfire

Profiling Hazards

Requirement §201.4(c)(2)(i): *[The State risk assessment shall include an overview of the] location of all natural hazards that can affect the State, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate*

A wildfire is an uncontrolled fire spreading through vegetative fuel often exposing or consuming structures. Wildfires often begin unnoticed and spread quickly and are usually sighted by dense smoke. Wildfires are placed into two classifications Wildland and Urban-Wildland Interface. Wildland fires are those occurring in an area where development is essentially nonexistent, except for roads, railroads, or power lines. Urban-Wildland Interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels. URWIN areas are divided into three subclasses:

- **Occluded interface**
Occluded interface are those areas of wildlands within an urban area for example a park bordered by urban development such as homes.
- **Intermixed**
Mixed or intermixed interface areas contain structures scattered throughout rural areas covered predominately by native flammable vegetation.
- **Classic**
Classic interface areas are those areas where homes press against wildland vegetation along a broad front.

When discussing wildfires it is important to remember that fires are part of a natural process and are needed to maintain a healthy ecosystem. When most of America was wilderness, wildfires burned 10 times the land that is consumed today. Yet, research shows forests were much healthier and hardier then. Wildfire is a natural part of forest ecosystems and is in fact, as necessary as water or sun. Fires cleanse and regenerate forests, giving new life to soil, and providing a new canvas for biodiversity to paint a new picture. Most all forest ecosystem types evolved with fire, and some trees, like the lodgepole pine, depend on the heat of fire to open their seed cones. A study conducted in 1995 found that of 146 threatened and endangered species of plants around the country, 135 benefited from wildland fire.

Three basic elements are needed for a fire to occur (1) a heat source (2) oxygen and (3) fuel. Two of the three sources are readily available throughout Utah. Major ignition sources for wildfire are lightning and human causes such as arson, recreational activities, burning debris, and carelessness with fireworks. On average, 65 percent of all wild fires started in Utah can be attributed to human activities. Once a wildfire has started, vegetation, topography and weather are all conditions having an affect wildfire behavior.

Vegetation Within Utah as it Relates to Wildfire

Fuels within Utah are generally conducive to high rates of spread, represented by National Fire Danger Rating System fuel models “L”, “K”, and “C”. Vegetation in Utah is broken into the following classifications based on fire hazard potential.

Table I-34 State Vegetation Types Classified by Hazard Rating

Vegetation Types	Description	Hazard Rating
Spruce/Fir, Mountain fir, Spruce Fir/Mountain Shrub, Mountain Fir/Mountain Shrub, Conifer/Aspen, Lodgepole Pine, Juniper, Pinyon/Juniper, Pinyon	High resistance to control, extreme intensity levels resulting in almost complete combustion of vegetation and possible damage to soils and seed sources depending on slope, rates of spread, wind speed and fuel loading.	EXTREME
Mountain Mahogany, Oak, Maple, Mountain Shrub, Sagebrush, Sagebrush/Perennial Grass, Salt Desert Scrub, Black Brush, Creosote/Bursage, Grease Wood, Ponderosa Pine/Mountain Shrub.	Moderate to high resistance to control, high to moderate intensity levels resulting in high to moderate damage to resources depending on slope, rates of spread, wind speed, and fuel loading.	HIGH
Ponderosa Pine, Grassland, Alpine, Dry Meadow, Desert Grassland	Moderate to low resistance to control, fire intensity levels would generally be low with moderate damage to resource values depending on slope, rates of spread, wind speed, fuel loading.	MODERATE
Aspen, Mountain Riparian, Lowland Riparian, Wet Meadow, Wetland	Low to moderate resistance to control, fire intensity levels would generally be low, little threat to human values and potentially beneficial to resource values depending on slope, rates of spread, wind speed, and fuel loading.	LOW

Utah Vegetation by Type

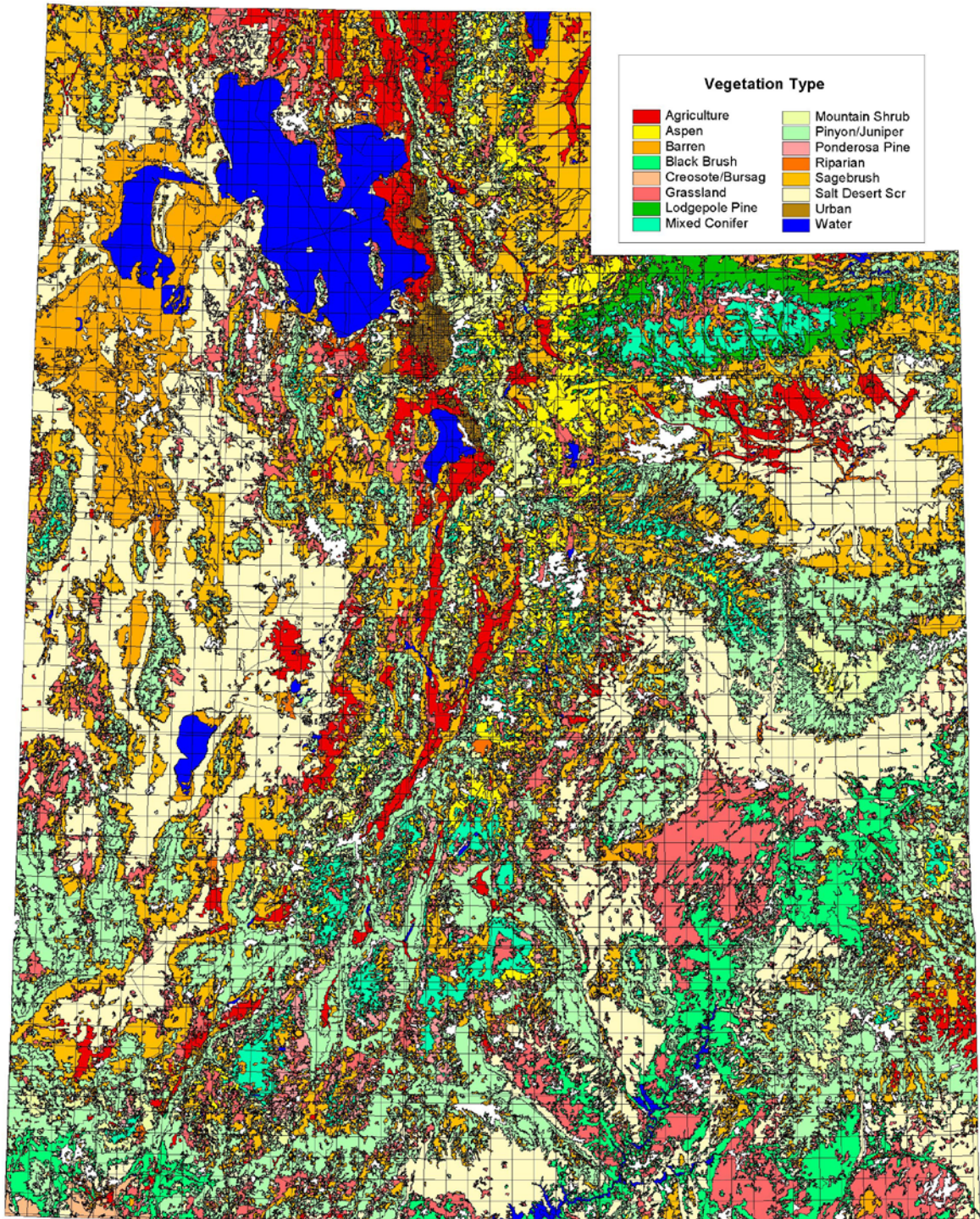


Figure I-25

Utah Wildland Fire Hazard

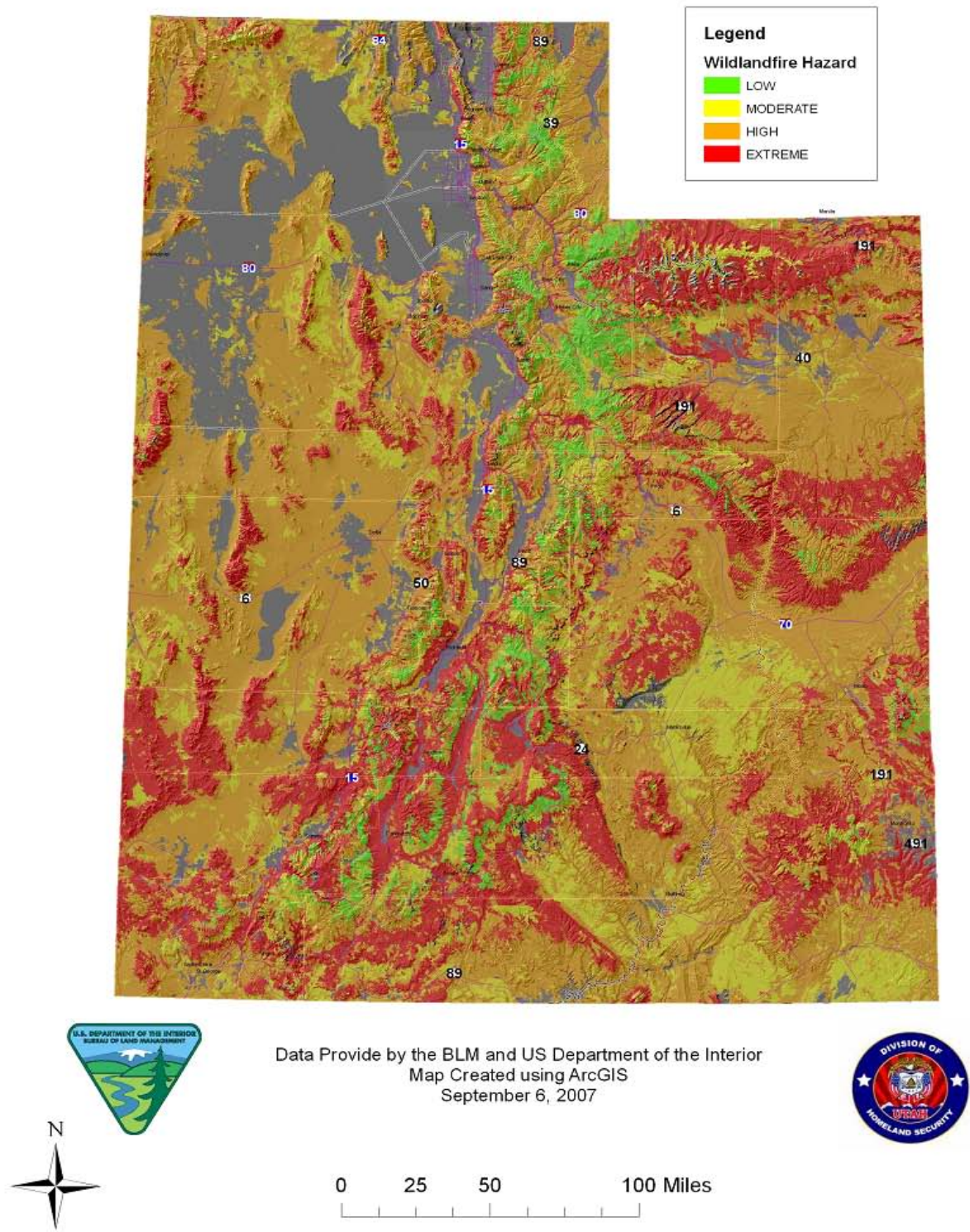


Figure I-26

Development and Wildfire

Throughout the United States, it is more and more common to see homes and other types of structures in wildland environments. This trend is greatly expanding wildland/urban interface areas, continually placing more and more structures in areas with large amounts of natural vegetation. Because of their location, these structures are extremely vulnerable to fire should a wildland fire occur in the surrounding area. Expansion into wildland areas also places wildland areas at risk, by increasing the number of ignition sources. The importance these wild areas have continues to grow with each passing year. The population of the Wasatch Front depends on water from our mountains and a wildfire can greatly impact the watershed.

Wildfire is a natural part of the ecosystems in Utah. Many of the grass, brush and tree species found in Utah have evolved with fire. Many of Utah's urban/wildland interface areas are located in our most fire prone wildland fuels. Generally, these fuels are found on drier, lower elevation sites, often very desirable for real estate development.

Families are moving into the Utah's countryside, just like they are all over the United States. They are building homes and associated buildings all through Utah's rural areas. People who live in urban areas want to "get away" from it all, even if it is only for the weekend. Developers are busy meeting their needs via summer home developments, recreational developments and other means. Use of fire prone wildland areas for homes and major recreational facilities create various threats: loss of life, homes, personal possessions, and natural resources.

Wildfire History

The 2007 wildfire season has been an intense and active one thus far. As of August 20, 2007, the state has experienced 15 wildfires that have burned over 5,000 acres. Three of these fires, the Neola North fire (43,511 acres), the Mildford Flats fire (363,052 acres), and the Salt Creek fire (25,456 acres) received fire suppression assistance, however the amount of assistance received has yet to be determined at the time of this report.

One fire in particular worth noting is the Mildford Flats fire. The Mildford Flats fire is the largest recorded fire in Utah history. A lightning strike ignited this fire three miles north of Milford, Utah on July 6, 2007. This fire burned at total of 363,052 acres in the Black Rock Desert west of Fillmore as well as throughout Millard and Beaver counties. Fortunately, only one uninhabited summer home and two outbuildings were burned.

The 2006 wildfire season was also an active one. The state experienced 1,843 total wildfires, 13 of which burned more than 5,000 acres. The 2004 and 2005 wildfire seasons combined experienced a total of 11 wildfires that burned over 5,000 acres.

In 2003, Utah was lucky. Early spring rains promoted grass growth. Grasses dry out prior to timber and ignite quite easy. This coupled with years of drought and high mortality rates in low elevation timber and shrubs made for prime fire conditions. Even though the 2003 fire season had 635, which burned 115,798 acres things could have been much worse.

Table I-35, details the total number of fires that have occurred in Utah since 1985, number of acres burned, and the total cost to the state of suppressing these fires.

Table I-35 Wildfire History 1985 to 2003

Year	Number of Fires	Acres Burned	Suppression Fund	Total State Cost
1985	443	47,242	Pre-Fund	
1986	457	62,042	Pre-Fund	
1987	490	63,648	Pre-Fund	
1988	605	30,819	Pre-Fund	
1989	482	46,617	Pre-Fund	
1990	415	30,093	Pre-Fund	
1991	300	12,029	Pre-Fund	\$2,041,369
1992	499	40,025	Pre-Fund	\$2,106,927
1993	262	13,949	Pre-Fund	\$1,371,793
1994	703	165,670	Pre-Fund	\$3,057,815
1995	579	88,139	Pre-Fund	\$2,234,507
1996	732	519,669	Pre-Fund	\$6,281,902
1997	391	27,665	Pre-Fund	\$4,610,890
1998	495	80,058	\$237,649	\$2,089,295
1999	735	133,353	\$659,704	\$4,257,522
2000	841	101,924	\$1,192,052	\$5,268,459
2001	835	94,632	\$2,609,010	\$5,359,422
2002	613	265,902	\$7,176,203	\$9,544,574
2003	635	115,798	N/A	N/A
2004	1,530	76,654	N/A	N/A
2005	1,236	313,932	N/A	N/A
2006	1,843	340,572	N/A	N/A

Wild fire Statistics from 1985-2003 courtesy of Utah Forestry, Fire, and State Lands

Wild fire Statistics from 2004-2006 courtesy of the Fire Activity Reports.

Cost were not available update

Between 1984 and 2006 Utah had 15,121 fires of those 77 burned more than 5,000 acres. From 1999 to present the state has received federal assistance through the Fire Management Assistance Grant Program FMAGP or Fire Suppression Assistance Grant Program FSA for three wildfires the Mollie wildfire, Mustang Wildfire, and Causey Wildfire. For 2007, fire suppression assistance received for the Neola North Wildfire, the Milford Flats Wildfire, and the Salt Creek Wildfire has yet to be determined. The total federal fire suppression assistance received for the Mollie (\$53,687.00) and Mustang wildfires (\$282,119.04) was \$335,806.04. Listed below are those fires burning more than 5,000 acres from 1984 through 2006. Note that in 2007, as of August 20th, there have been 15 fires burning more than 5,000 acres, but this time, these fires have not been included in this table.

Wildfires that have burned 5000+ acres from 1984 - 2006 include the following:

Ten Mile	Hansel Valley Mountain	Blue Spring
Cattle Rock	Ox Valley-Central Meadow	Dammeron Complex
Topliff	Camp Williams	Diamond Complex
Tekoi	Johnson Canyon	Ditto
West Mona	Quincy	Park Valley
Pony Road	Uinta Flats	Red
Rose Ranch South	Sage Valley	Sunrise Complex
Sand Mountain	Dry Canyon II	West Gibson
Railroad Fire (61,009 acres)	Sarah	Westside Complex
Flat Fire	Fort Ranch	Kolob
Hogup	Lava Ridge	Jarvis
Ripple Valley	Affleck Park	Bull Complex
Dog Valley Wash	Davis Complex	Scorpio
Davis Knolls	Desert Mountain	Ranch
Milford Bench	Soldier Pass	Oak City Complex
Golden Spike	Turkey	Dog Valley
Honey Boy	Antelope Island #2	Twin Peaks
Indian Reservoir	Hansel Mt-Rattlesnake	Reilly Complex
Round Top	Magatsu Complex	Hogups
Milford Pass	Cunningham	Badger
Fool Creek	Black Rock	Devils Den
Negro Mag	Mollie	Valley
Big Hollow Complex	Beef Hallow	
Wide Canyon	Fort Ranch (35,600 acres)	
Cedar Packetts Wash	Mustang	
Diamond Peak	Hawkins	
North Stansbury Complex	Complex Square	

Assessing Vulnerability by Jurisdiction

Requirement §201.4(c)(2)(ii): *[The State risk assessment shall include an] overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments as well as the State risk assessment. The State shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. State owned critical or operated facilities located in the identified hazard areas shall also be addressed*

Requirement §201.4(d): *Plan must be reviewed and revised to reflect changes in development...*

Geographic data mapped on the following pages was provided by the BLM and the US Department of the Interior and is current data through 2006. These analyses assess wildland fire hazards based on a combination of accumulated values including landcover, fire hazard potential, and vegetation. DHS simplified the BLM ratings, categorizing them into one of four ratings low, moderate, high, and extreme. Using a series of

overlays and clips, wildfire data for each individual county were clipped and queried in ArcView 9.2 in order to determine how many square miles per county fall within each wildfire hazard category.

Table I-36 County Wildfire Vulnerability

County Name	Extreme Hazard (square miles)	High Hazard (square miles)	Moderate Hazard (square miles)	Low Hazard (square miles)
Beaver	1170.5	969.2	310.4	54.1
Box Elder	291.2	2776.7	870.5	13.6
Cache	111.0	448.1	122.1	166.9
Carbon	484.6	634.3	216.6	117.7
Daggett	369.7	274.4	31.0	7.9
Davis	1224.5	1077.3	465.8	122.7
Duchesne	13.9	84.9	25.9	11.0
Emery	1112.0	1985.2	1075.3	78.1
Garfield	1942.9	1811.6	813.4	425.1
Grand	990.9	2236.8	321.2	63.0
Iron	1292.3	1039.6	397.7	97.4
Juab	482.2	2229.6	349.6	38.5
Kane	1238.8	1897.5	743.5	71.6
Millard	687.9	4568.7	799.9	79.7
Morgan	24.0	383.7	101.5	73.8
Piute	441.2	116.3	60.6	96.2
Rich	19.9	709.9	79.5	64.3
Salt Lake	69.5	233.7	86.2	52.1
San Juan	1954.0	3884.9	1656.6	89.6
Sanpete	303.4	555.0	302.9	200.5
Sevier	702.0	445.6	304.2	315.6
Summit	605.0	5921.0	253.0	311.2
Tooele	600.3	3058.0	926.0	16.4
Uintah	1193.3	2748.4	300.2	47.5
Utah	290.0	877.4	258.1	237.2
Wasatch	122.9	372.7	144.4	496.6
Washington	891.0	1121.2	297.8	24.6
Wayne	551.8	1036.7	706.5	85.1
Weber	19.1	204.3	70.4	77.2

Estimating Potential Losses by Jurisdiction

Requirement §201.4(c)(2)(iii): *[The State risk assessment shall include an] overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas.*

Requirement §201.4(d): *Plan must be reviewed and revised to reflect changes in development...*

The Utah counties are ranked based on total area in square miles that are within high or extreme wildfire risk areas.

1. San Juan	11. Iron	21. Rich
2. Millard	12. Duchesne	22. Daggett
3. Uintah	13. Beaver	23. Cache
4. Garfield	14. Washington	24. Piute
5. Tooele	15. Wayne	25. Wasatch
6. Grand	16. Summit	26. Morgan
7. Kane	17. Utah	27. Salt Lake
8. Emery	18. Sevier	28. Weber
9. Box Elder	19. Carbon	29. Davis
10. Juab	20. Sanpete	

The total amount of land area per county that is highly susceptible to wildfire provides insight as to where higher wildfire risk is located, however, it does not effectively rank wildfire risk to Utah's population and infrastructures. The next rankings and tables list the number of population per county within high or extreme wildfire areas. Daytime and night-time population data are provided by Landscan 2005 data which illustrates the location of a population and population density. The Landscan data set was derived by the Oak Ridge National Laboratory utilizing a combination of information such as 2000 census data, proximity of population to roads, slopes, land cover, night-time lights, and other information that is then apportioned to each three second arc-second grid areas. An arc-second is a measure of latitude and longitude used by geographers that equates to approximately 90 meters by 90 meters in area. It is important to note that when working with population density data points, a 90m X 90m resolution is at a finer scale than census block data.

Table I-37 County Ranking of Daytime Population Within High or Extreme Wildfire Areas

1. Washington	11. Uintah	21. Juan
2. Salt Lake	12. Emery	22. Kane
3. Utah	13. Sanpete	23. Wasatch
4. Iron	14. Sevier	24. Morgan
5. Summit	15. Garfield	25. Cache
6. Tooele	16. Millard	26. Wayne
7. San Juan	17. Grand	27. Daggett
8. Duchesne	18. Davis	28. Piute
9. Carbon	19. Beaver	29. Rich
10. Weber	20. Box Elder	

Table I-38 County Ranking of Night-time Population Within High or Extreme Wildfire Areas

1. Washington	11. Sanpete	21. Millard
2. Salt Lake	12. Uintah	22. Grand
3. Duchesne	13. Cache	23. Sevier
4. Utah	14. Davis	24. Garfield
5. Summit	15. Box Elder	25. Piute
6. Iron	16. Juab	26. Beaver
7. Weber	17. Emery	27. Daggett
8. Tooele	18. Wasatch	28. Wayne
9. Carbon	19. Morgan	29. Rich
10. San Juan	20. Kane	

Table I-39 Daytime Population Totals within High or Extreme Wildfire Areas

County	Total Vulnerable Persons
Beaver	1,738
Box Elder	1,639
Cache	606
Carbon	4,706
Daggett	459
Davis	1,751
Duchesne	5,026
Emery	2,783
Garfield	2,264
Grand	1,818
Iron	10,236
Juab	1,389
Kane	1,114
Millard	2,026
Morgan	727
Piute	374
Rich	51
Salt Lake	27,478
San Juan	6,102
Sanpete	2,757
Sevier	2,281
Summit	7,271
Tooele	7,040
Uintah	3,416
Utah	15,638
Wasatch	1,097
Washington	38,720
Wayne	462
Weber	4,020
Total	253,631

Table I-40 Night-time Population Totals within High or Extreme Wildfire Areas

County	Total Vulnerable Persons
Beaver	390
Box Elder	1,537
Cache	1,772
Carbon	5,327
Daggett	350
Davis	1,751
Duchesne	13,657
Emery	1,279
Garfield	561
Grand	694
Iron	7,931
Juab	1,399
Kane	944
Millard	796
Morgan	967
Piute	469
Rich	248
Salt Lake	15,540
San Juan	4,750
Sanpete	2,654
Sevier	685
Summit	8,289
Tooele	5,612
Uintah	2,178
Utah	12,354
Wasatch	988
Washington	43,056
Wayne	339
Weber	6,668
Total	238,585

Wildfire Loss Calculations

Calculating structural damage, economic loss, and deaths due to wildfire is difficult as no loss estimation tables or curves exist. FEMA publication 386-2 State and Local Mitigation Planning how-to guide Understanding Your Risks identifying hazards and estimating losses states the following under the determine the extent of damage from wildfires section:

- No loss estimation tables for wildfires
- No standard loss estimation model or table for wildfire damaged content
- No standard displacement time or functional downtime tables for wildfire
- No death or injury curves for wildfires.

However, as demonstrated in the previous section, at-risk populations to wildfire hazard can be identified, so proper mitigation actions can be taken to protect lives and property.

Assessing Vulnerability by State Facilities

Requirement §201.4(c)(2)(ii): *[The State risk assessment shall include an] overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments as well as the State risk assessment. The State shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. State owned critical or operated facilities located in the identified hazard areas shall also be addressed*

Requirement §201.4(d): *Plan must be reviewed and revised to reflect changes in development...*

State facilities data updated in April 2006 was provided by Utah's AGRC. The data presented in this shape file was compiled with the help of several state agencies and entities. This state owned facilities data set was overlaid on top of the state wildfire risk map. The updated state wildfire risk map was produced as a result of the State-wide Fire Risk Assessment and is available through the AGRC. Using the "select by location" feature in ArcView 9.2, all of the vulnerable structures intersecting the high or extreme wildfire susceptibility areas were selected. The selected items were then saved as a layer files, and the current value of the facilities were calculated.

Table I-41 Total Number of State Owned Facilities in Wildfire Risk Areas

County	Total Vulnerable Structures
Beaver	8
Box Elder	10
Cache	28
Carbon	34
Daggett	16
Davis	22
Duchesne	26
Emery	39
Garfield	12
Grand	10
Iron	24
Juab	16
Kane	22
Millard	5
Morgan	8
Piute	11
Rich	4
Salt Lake	53
San Juan	31
Sanpete	6
Sevier	12
Summit	32
Tooele	11
Uintah	11
Utah	12
Wasatch	55
Washington	47
Wayne	4
Weber	14
Total	583

Estimating Potential Losses by State Facilities

Requirement §201.4(c)(2)(iii): [The State risk assessment **shall** include an] overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State **shall** estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas.

Requirement §201.4(d): Plan must be reviewed and revised to reflect changes in development...

Approximate current values for state owned facilities were provided by the AGRC. Current values of the state owned facilities were updated in 2006. ArcView 9.2 was used to determine which state-owned facilities are within high or extreme wildfire risk areas. The current values of those facilities within high or extreme wildfire risk areas were then summed in order to determine the total estimated current value of at-risk facilities for each county.

Table I-42 Total Insured Value of State Owned Facilities in Wildfire Risk Areas

County	Total Vulnerable Structures	Estimated Current Value
Beaver	8	\$152,068
Box Elder	10	\$1,979,735
Cache	28	\$2,655,725
Carbon	34	\$9,459,750
Daggett	16	\$1,781,439
Davis	22	\$845,143
Duchesne	26	\$1,829,825
Emery	39	\$1,854,084
Garfield	12	\$1,027,942
Grand	10	\$1,725,610
Iron	24	\$52,690,762
Juab	16	\$1,258,376
Kane	22	\$2,199,312
Millard	5	\$421,876
Morgan	8	\$283,170
Piute	11	\$393,354
Rich	4	\$0
Salt Lake	53	\$46,889,886
San Juan	31	\$13,782,399
Sanpete	6	\$729,648
Sevier	12	\$1,186,971
Summit	32	\$3,025,861
Tooele	11	\$1,636,536
Uintah	11	\$393,818
Utah	12	\$1,992,885
Wasatch	55	\$11,857,363
Washington	47	\$135,021,117
Wayne	4	\$706,100
Weber	14	\$18,575,085
Total	583	\$316,355,840